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NATIONAL MARINE FISHERIES SERVICE
ALASKA FISHERIES SCIENCE CENTER
AUKE BAY LABORATORY
11305 Glacier Hwy, Juneau, AK 99801-8626
(907) 789-6000

24 hour RAPICOM (907) 789-6094

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CRUISE RESULTS

North Pacific Cooperative Fisheries of Japan Vessel
Anyo maru No. 22
Cruise No. 93-01

Japan/U.S. cooperative longline survey for sablefish and Pacific cod in the Aleutian region, eastern Bering Sea, and Gulf of Alaska, 1993

Prepared by Thomas L. Rutecki

INTRODUCTION

Since 1978, Japan and the United States have conducted an annual, cooperative longline survey in the northeastern Pacific Ocean along Alaska's continental slope. Formerly (1978-88), the Fisheries Agency of Japan was responsible for the survey. Since 1989, however, the survey has been conducted by a private Japanese organization, the North Pacific Cooperative Fisheries of Japan, in cooperation with the Alaska Fisheries Science Center (AFSC) of the U.S. National Marine Fisheries Service. The 1993 survey was conducted between April and September using the Anyo maru No. 22, a commercial Japanese longline vessel provided by the North Pacific Cooperative Fisheries of Japan. As in previous years, the survey was directed primarily at sablefish (Anoplopoma fimbria) and Pacific cod (Gadus macrocephalus) distributed between depths of 100 m and 1,000 m. Survey areas included the Western Aleutians, Eastern Aleutians, Regions I, II, III, IV, and V of the eastern Bering Sea, and the former International North Pacific Fisheries Commission (INPFC) statistical areas: Shumagin, Chirikof, Kodiak, Yakutat, and Southeastern (Fig. 1). These surveys now provide 15 consecutive years (1979-93) of standardized data for the Gulf of Alaska and Aleutian region, and 12 years (1982-93) of standardized data for the eastern Bering Sea. (A pilot study was conducted during the first year, 1978.)

OBJECTIVES

1. Monitor annual changes in the relative abundance and size composition of sablefish and Pacific cod along the continental slope of Alaska.

2. Monitor annual changes in stock condition of other major fish species caught in the survey, including Pacific halibut (Hippoglossus stenolepis), arrowtooth flounder (Atheresthes stomias), Greenland turbot (Reinhardtius hippoglossoides), rockfish (Sebastes spp.), thornyheads (Sebastolobus spp.), and grenadiers (Macrouridae).

3. Tag and release sablefish throughout the cruise to determine migration patterns.

4. Collect sablefish otoliths to study age composition of the population.

ITINERARY

Date	Activity
April 30	Depart Shiogama, Japan.
May 1-5	In transit to western Aleutian Islands.
May 6-June 7	Fish 30 stations in the Aleutian Islands and eastern Bering Sea.
June 8	In port, Dutch Harbor, Alaska, to resupply vessel.
June 9-July 9	Fish 30 stations in the eastern Bering Sea.
July 10-11	In port, Dutch Harbor, to exchange scientific personnel and resupply vessel.
July 12-August 14	Fish 34 stations in the eastern Bering Sea and western Gulf of Alaska.
August 15-16	In port, Seward, Alaska, to exchange scientific personnel and resupply vessel.
August 17-September 7	Fish 23 stations in the eastern Gulf of Alaska.
September 8-9	Transit to Seattle.
September 10	Arrive Seattle, Washington; end cruise.

METHODS

The 1993 survey methods were similar to those used in previous years. The Anyo maru No. 22, a 57.7 m (189 ft) longline vessel, carried a crew of 23 Japanese nationals. A single station was occupied each day. At each station, one longline 16 km (8.6 nm) long was set and retrieved. The longline consisted of 160 hachis (Japanese term for "skates" or lengths of longline), each 100 m (328 ft) long, tied together. Halibut anchors and surface buoys were attached at the beginning and end of the longline and one-third and two-thirds along the line. A 3-kg (7 lb) rock anchored each hachi. Each hachi had 45 "J" style hooks spaced at 2 m intervals along the line. Thus, 7,200 hooks were fished each day at a station. The hooks were baited with squid and were attached to the line by 1.2-m (47-in) long gangions.

Previously (1982-1989), 108 stations were usually fished. Locations of each station were replicated as much as possible from year to year. In 1990, the number of planned stations was increased to 117, nine additional stations being added in the northern part of the eastern Bering Sea (area Bering V in Figure 1). These same 117 stations were sampled in the 1993 survey.

Depths between 100 m and 1,000 m (55-548 fm) were fished. These depths correspond to the bathymetric distribution of most commercial-size sablefish in Alaska waters. However, because of bottom irregularities and the varied angle of the continental slope, it was impossible to fish the complete depth range at all stations. The longline was usually set starting in shallow water, and then laid seaward across the isobaths of the continental slope into deeper water. The gear was then retrieved in the same direction, i.e., shallow to deep. At a few stations, however, the longline had to be set and retrieved in an opposite direction (deep to shallow) because of strong currents or winds. Additionally, at some stations, where Pacific cod was the primary species of interest and the angle of the continental slope was gradual, the entire longline was set at depths less than 400 m. Most of these shallow stations were in the eastern Bering Sea. Also, in 1993, the number of hachis was increased to 180 at 31 stations in the eastern Bering Sea and Eastern Aleutians to collect additional survey data for Greenland turbot. Depths greater than 1,000 m were fished at 10 of those stations; maximum depth fished for any station was 1,220 m (670 fm).

At each station, the soak time (time between set and retrieval) of an individual hachi depended upon the hachi's location in the longline. Setting the gear usually began in the morning (~0745 hours ADT) and finished within 1 h. The vessel then returned to the starting position, waited until the first hachi had been in the water for ~3 h, and began hauling the gear. Retrieval of the entire longline usually lasted 5-6 h. Thus, soak time varied from 3 h at the beginning of the longline to 7 or 8 h at the end.

The catch was tallied by species and hachi number as the longline was brought aboard. Also, the depth at which the fish were caught was estimated by measuring the depth of water every fifth hachi.

The catch was then sorted by species for further sampling. Pacific halibut were landed without a gaff, length measured, and immediately released. Other species were retained and weighed. Commonly caught fish were individually measured to determine length frequencies. These included sablefish, Pacific cod, arrowtooth flounder, Greenland turbot, rougheye rockfish (Sebastes aleutianus), shortraker rockfish (S. borealis), shortspine thornyhead (Sebastolobus alascanus), giant grenadier (Albatrossia pectoralis), and other grenadiers (Coryphaenoides spp.). Sablefish and Pacific cod were separated by sex and depth stratum before they were measured.

At most stations, a subsample of sablefish was held in live tanks, and then tagged and released. Only robust, uninjured fish, usually <70 cm in fork length, were tagged. The tags used were plastic anchor tags, as in previous years. The AFSC Resource Assessment and Conservation Engineering (RACE) Division supplied the tags used in the Aleutian region, eastern Bering Sea, and western half of the Gulf of Alaska (labeled "U.S. National Marine Fisheries Reward, Seattle, Washington U.S.A."). The AFSC Auke Bay Laboratory (ABL) supplied the tags used in the eastern half of the Gulf of Alaska (labeled "U.S. National Marine Fisheries Reward, Auke Bay, Alaska USA").

Sablefish otoliths were collected throughout the cruise for the AFSC. Generally, two otoliths were collected per fish. In the Aleutian Islands, otoliths were taken from five fish per centimeter length per sex; the sampling rate was the same in the eastern Bering Sea. In the Gulf of Alaska, the sampling strategy differed: otoliths were taken from five fish per centimeter length per sex in each of 3 depth strata (101-200 m, 201-400 m, and 401-1,000 m) in 3 areas (Shumagin, Kodiak, and Southeastern), resulting in nine separate otolith collections for this region.

Grenadiers were discarded after completion of sampling because they were not marketable. The remainder of the catch was processed and frozen for sale in Japan as food to help defray the Japanese fishing cooperative's cost of conducting the survey.

RESULTS

A total of 117 stations were sampled by the Anyo maru No. 22 during the 1993 cruise (Fig. 1). The exact positions and starting and ending depths for all the stations fished in 1993 are listed in Table 1.

During the cruise, 19,344 hachis (1,934 km; 1,044 nm) of longline gear were set. A total of 288,556 fish were caught on the 870,480 hooks set; thus, 33.1% of the hooks retained fish.

Sablefish and Pacific cod made up most of the catch (Table 2). Sablefish comprised 28.1% (81,213 fish) of the catch in numbers, and Pacific cod, 24.4% (70,327 fish). Sablefish was most abundant in the Gulf of Alaska, and Pacific cod was most abundant in the eastern Bering Sea. Catch rates and average weights of sablefish and Pacific cod for each station are listed in Table 3. The highest catch rate for sablefish was at station 102 (47.8 fish/100 hooks), and for Pacific cod at station 19 (32.75 fish/100 hooks). Compared to the 1992 cooperative survey, catches of sablefish increased 38% in the Aleutians and declined 58.9% in the eastern Bering Sea. Total sablefish catch in the Gulf of Alaska in the 1993 survey increased 2.4% from 1992. The survey catches of Pacific cod declined 22.2% in the Aleutians between 1992 and 1993, but increased 37.4% in the eastern Bering Sea.

Among the other species caught during the survey, giant grenadier was most abundant, followed by arrowtooth flounder, skates, Greenland turbot, rockfish, and thornyheads, (Table 2). Catches of giant grenadier were highest in the Aleutians and western Gulf of Alaska. The catch of Greenland turbot increased 100.4% from 1991 and nearly all were caught in the eastern Bering Sea and Aleutian Islands. Most rockfish were rougheye or shortraker. Shortraker rockfish was most abundant in the Eastern Aleutian and Yakutat areas, whereas rougheye rockfish was most abundant in the Aleutians and Southeastern areas.

In past surveys, killer whales often greatly interfered with the longline operations at stations in the eastern Bering Sea by stripping hooked fish off the line. In the 1993 survey, killer whales were observed near a number of stations in the eastern Bering Sea and Eastern Aleutians (stations 23, 27, 29, 30, 31, 32, 37, 55, 56, 57, 58, 64, and 68) but did not appear to take many fish from the line.

During the 1993 survey 4,022 sablefish were tagged and released, 5.0% of all sablefish caught (Table 2). Most of the fish were tagged in the Gulf of Alaska. Since 1978, 165,223 tagged sablefish have been released during the surveys.

Otoliths were collected for studies of age analysis from 2,996 sablefish: 582 in the Aleutian region and eastern Bering Sea, and 2,414 in the Gulf of Alaska.

Comprehensive analyses of the 1993 survey data for sablefish, including length compositions and estimates of relative population numbers and weights, will be completed for the Gulf of Alaska by the AFSC Auke Bay Laboratory, and for the Aleutian region and eastern Bering Sea by the AFSC Resource Ecology and Fisheries Management Division. The 1993 results for the Gulf of Alaska will also be compared with results from another longline survey in the Gulf (the 1993 domestic longline survey) by the AFSC RACE Division. Both surveys take place during the same time of the year (July-September). Detailed results from all these analyses will be available from the AFSC at a later date. For additional information, contact Dr. George Snyder at the Auke Bay Laboratory, 11305 Glacier Highway, Juneau, Alaska 99801 (907) 789-6001.

SCIENTIFIC PERSONNEL

April 30-September 10
Kiyoshi Fujii, North Pacific Cooperative Fisheries of Japan, Tokyo, Japan
H. Okabe, North Pacific Cooperative Fisheries of Japan, Tokyo, Japan.

April 30-July 9
Darlene Everhart, AFSC/RACE Division, Seattle, Washington, U.S.A.

July 11-August 15
John Karinen, AFSC/ABL, Auke Bay, Alaska, U.S.A.

August 17-September 10
Darlene Everhart, AFSC/RACE Division, Seattle, Washington, U.S.A.

Table 1. Position and depth of stations, Japan-U.S. cooperative longline survey, 1993.

Station number	Position at start of longline		Position at end of longline		Depth start (m)	Depth end (m)
			Eastern Bering Sea			
1	58°47.0'N	177°34.0'W	58°49.6'N	177°50.9'W	155	735
2	58°43.1'N	176°38.2'W	58°33.8'N	176°52.3'W	153	740
3	58°41.6'N	176°01.2'W	58°35.7'N	176°12.3'W	140	193
4	58°30.3'N	175°40.3'W	58°29.6'N	175°55.5'W	200	1,130
5	58°38.5'N	174°19.0'W	58°32.4'N	174°29.8'W	157	195
6	58°20.4'N	174°19.7'W	58°20.6'N	174°27.2'W	188	920
7	58°01.0'N	173°50.8'W	57°53.0'N	173°51.3'W	130	145
8	57°37.9'N	174°10.2'W	57°45.6'N	174°19.3'W	160	1,115
9	57°05.6'N	173°27.5'W	57°08.0'N	173°14.3'W	130	255
10	56°49.8'N	173°22.4'W	56°57.4'N	173°27.6'W	203	715
11	56°41.1'N	172°11.5'W	56°37.8'N	172°25.8'W	132	181
12	56°37.6'N	172°20.8'W	56°30.4'N	172°27.9'W	200	800
13	56°26.9'N	171°25.2'W	56°26.0'N	171°40.7'W	203	1,050
14	56°23.1'N	171°15.9'W	56°15.8'N	171°10.8'W	146	161
15	55°09.4'N	170°38.8'W	56°08.6'N	170°52.7'W	160	1,060
16	56°07.3'N	169°57.0'W	56°00.4'N	169°52.7'W	126	174
17	56°02.8'N	169°38.5'W	55°57.6'N	169°53.4'W	174	1,155
18	56°18.5'N	169°10.6'W	56°09.7'N	169°17.1'W	151	753
19	56°01.6'N	168°09.9'W	56°03.5'N	168°24.5'W	151	270
20	55°49.8'N	168°50.2'W	55°55.9'N	169°01.6'W	180	910
21	55°36.2'N	168°24.0'W	55°36.8'N	168°38.9'W	146	265
22	55°26.9'N	168°03.0'W	55°22.2'N	168°17.2'W	180	880
23	55°01.3'N	167°01.0'W	54°56.4'N	167°12.5'W	158	257
24	54°48.9'N	167°15.8'W	54°56.0'N	167°10.4'W	246	428
25	54°50.7'N	167°20.7'W	54°45.1'N	167°32.6'W	446	830
26	54°30.1'N	167°08.4'W	54°20.8'N	167°11.6'W	493	1,050
27	54°40.0'N	166°24.1'W	54°31.8'N	166°28.6'W	325	464
28	54°48.0'N	166°15.0'W	54°44.4'N	166°22.1'W	188	302
29	54°55.4'N	166°02.5'W	54°49.3'N	166°11.6'W	146	170
30	54°27.0'N	165°38.5'W	54°29.4'N	165°53.3'W	170	485
31	54°06.1'N	166°23.7'W	54°15.4'N	166°22.3'W	118	805
32	53°46.3'N	167°19.5'W	53°45.6'N	167°28.2'W	126	910
33	53°35.4'N	168°15.6'W	53°38.5'N	168°02.2'W	300	885
34	53°15.7'N	168°47.5'W	53°22.3'N	168°58.4'W	330	960
109	60°48.0'N	178°22.3'W	60°42.0'N	178°34.6'W	175	189
110	60°06.1'N	178°51.3'W	60°04.5'N	179°08.6'W	187	572
111	60°21.8'N	178°23.0'W	60°13.0'N	178°28.2'W	175	189
112	60°28.0'N	178°20.7'W	60°21.5'N	178°31.8'W	176	235
113	59°50.2'N	178°29.8'W	59°48.7'N	178°47.0'W	150	806
114	59°38.3'N	177°10.0'W	59°35.6'N	177°24.4'W	159	190
115	59°36.2'N	178°10.7'W	59°34.6'N	178°28.2'W	180	745
116	59°22.8'N	177°22.8'W	59°13.5'N	177°32.8'W	173	191
117	59°14.0'N	178°06.8'W	59°20.4'N	178°18.9'W	168	885

Table 1.--(Continued).

Station number	Position at start of longline		Position at end of longline		Depth start (m)	Depth end (m)
			Aleutian Region			
35	53°01.8'N	170°08.4'W	53°07.7'N	170°18.9'W	185	943
36	52°49.7'N	171°15.4'W	52°47.5'N	171°02.8'W	158	700
37	52°16.3'N	173°30.0'W	52°25.2'N	173°28.8'W	120	763
38	52°08.6'N	175°24.5'W	52°12.4'N	175°14.0'W	126	1,060
39	52°08.0'N	175°38.0'W	52°10.6'N	175°49.3'W	120	1,080
40	51°59.4'N	176°27.4'W	52°04.7'N	176°18.4'W	118	1,183
41	51°54.0'N	177°33.4'W	51°55.8'N	177°33.9'W	510	1,220
42	51°46.4'N	178°58.0'W	51°40.0'N	178°50.6'W	295	700
43	52°02.7'N	178°16.5'E	52°07.5'N	178°22.8'E	130	880
44	52°15.6'N	176°00.0'E	52°18.3'N	176°10.0'E	182	560
45	52°40.7'N	174°26.7'E	52°45.4'N	174°17.2'E	102	945
46	53°04.3'N	172°51.4'E	53°08.3'N	172°40.3'E	102	721
47	52°32.2'N	173°02.9'E	52°32.3'N	172°50.3'E	120	815
48	52°20.0'N	174°15.1'E	52°15.2'N	174°06.2'E	190	873
49	51°42.9'N	175°49.1'E	51°36.1'N	175°42.8'E	105	925
50	51°46.8'N	177°00.0'E	51°41.2'N	177°09.4'E	185	1,000
51	51°45.0'N	178°07.7'E	51°37.0'N	178°07.8'E	110	456
52	51°20.6'N	179°04.1'E	51°13.0'N	179°02.1'E	103	730
53	51°24.4'N	178°36.8'W	51°22.1'N	178°25.0'W	175	905
54	51°45.8'N	178°10.5'W	51°44.3'N	178°21.1'W	100	540
55	51°35.6'N	177°37.3'W	51°31.7'N	177°47.3'W	190	818
56	51°33.5'N	176°45.1'W	51°25.8'N	176°51.2'W	173	812
57	51°44.4'N	176°00.7'W	51°36.3'N	176°04.0'W	170	630
58	51°53.1'N	175°07.2'W	51°44.8'N	175°07.4'W	154	455
59	51°53.8'N	174°19.2'W	51°47.3'N	174°28.2'W	126	820
60	51°54.9'N	173°31.7'W	51°51.2'N	173°42.2'W	126	715
61	52°26.5'N	170°16.1'W	52°20.4'N	170°25.7'W	118	635
			Gulf of Alaska			
62	52°35.2'N	169°30.0'W	52°28.1'N	169°30.5'W	147	660
63	52°58.2'N	168°09.1'W	52°50.3'N	168°13.5'W	120	825
64	53°12.2'N	166°50.3'W	53°04.0'N	166°54.3'W	203	780
65	53°34.2'N	165°40.1'W	53°27.2'N	165°45.3'W	134	700
66	53°44.6'N	164°23.1'W	53°38.4'N	164°32.3'W	141	715
67	53°58.7'N	163°14.2'W	53°51.8'N	163°21.8'W	117	818
68	54°05.3'N	162°01.3'W	54°03.8'N	162°13.8'W	131	783
69	54°19.4'N	161°01.8'W	54°12.0'N	161°07.5'W	140	843
70	54°21.9'N	160°12.1'W	54°14.0'N	160°16.4'W	148	652
71	54°29.3'N	159°15.1'W	54°22.6'N	159°23.5'W	169	835
72	54°40.5'N	158°27.0'W	54°33.1'N	158°35.3'W	190	823
73	54°51.8'N	157°43.1'W	54°44.6'N	157°48.1'W	168	718
74	55°14.0'N	156°34.8'W	55°07.0'N	156°42.7'W	200	856
75	55°37.5'N	155°51.9'W	55°29.6'N	155°47.2'W	188	234
76	55°45.3'N	155°07.9'W	55°37.7'N	155°11.2'W	178	655

Table 1.--(Continued).

Station number	Position at start of longline		Position at end of longline		Depth start (m)	Depth end (m)
77	55°59.8'N	154°37.1'W	55°53.7'N	154°45.5'W	400	906
78	56°00.0'N	154°00.8'W	55°59.1'N	154°04.8'W	201	780
79	56°18.9'N	153°00.6'W	56°15.1'N	153°11.7'W	126	765
80	56°33.0'N	152°02.7'W	56°26.4'N	152°09.4'W	173	880
81	57°06.4'N	151°16.0'W	56°59.2'N	151°21.8'W	265	812
82	57°24.2'N	150°36.3'W	57°16.7'N	150°33.5'W	178	750
83	57°38.0'N	149°52.1'W	57°30.2'N	149°55.8'W	380	830
84	57°58.6'N	149°09.0'W	57°50.7'N	149°14.6'W	170	910
85	58°17.1'N	148°39.2'W	58°09.8'N	148°39.4'W	180	830
86	58°39.8'N	148°17.0'W	58°32.2'N	148°20.5'W	300	920
87	59°08.5'N	148°37.0'W	59°00.5'N	148°39.3'W	158	240
88	59°02.1'N	147°53.2'W	58°54.5'N	147°56.7'W	180	830
89	59°16.8'N	146°49.0'W	59°10.6'N	146°58.7'W	191	918
90	59°29.1'N	145°26.7'W	59°28.2'N	145°33.1'W	168	825
91	59°31.1'N	144°42.0'W	59°27.0'N	144°55.2'W	196	840
92	59°34.1'N	143°38.0'W	59°27.3'N	143°39.0'W	158	960
93	59°35.8'N	142°30.7'W	59°29.8'N	142°37.4'W	186	890
94	59°23.6'N	142°10.2'W	59°26.8'N	142°21.3'W	230	900
95	59°02.7'N	141°20.1'W	59°01.8'N	141°33.0'W	293	810
96	58°41.2'N	140°39.5'W	58°43.0'N	140°53.1'W	240	840
97	58°28.5'N	139°28.8'W	58°25.9'N	139°40.2'W	190	930
98	58°08.5'N	138°43.5'W	58°11.1'N	138°55.2'W	190	950
99	57°52.1'N	137°21.7'W	57°53.3'N	137°32.6'W	188	860
100	57°30.4'N	136°30.8'W	57°36.5'N	136°36.8'W	198	850
101	57°11.1'N	136°14.4'W	57°16.7'N	136°21.8'W	250	880
102	56°50.1'N	136°01.0'W	56°57.1'N	136°06.6'W	243	863
103	56°24.4'N	135°24.1'W	56°22.1'N	135°38.4'W	157	390
104	55°57.3'N	135°24.5'W	56°01.7'N	135°33.8'W	265	810
105	55°32.7'N	134°59.2'W	55°37.8'N	135°09.1'W	280	920
106	55°20.3'N	134°43.0'W	55°23.4'N	134°54.6'W	270	823
107	54°53.4'N	134°17.8'W	55°00.1'N	134°25.8'W	260	870
108	54°27.9'N	133°56.2'W	54°33.3'N	134°04.6'W	275	920

Table 2.--Numbers of fish caught and sablefish tagged, by area[2], Japan-U.S. cooperative longline survey in the Aleutian region, eastern Bering Sea, and Gulf of Alaska, 1993.

Species	Western Aleutians	Eastern Aleutians	Bering I	Bering II	Bering III	Bering IV	Bering V	Shumagin	Chirikof	Kodiak	Yakutat	South-eastern	Total
Sablefish	385	3,137	749	613	146	106	64	11,448	9,351	14,390	20,173	18,800	79,362
Pacific cod	8,716	2,496	2,496	15,633	6,480	4,209	7,872	7,158	2,894	798	386	397	59,535
Pacific halibut	418	270	89	277	454	112	726	137	63	19	50	53	2,668
Arrowtooth flounder	727	688	1,077	11,753	4,154	1,768	3,235	3,231	3,910	2,470	837	605	34,455
Greenland turbot	259	1,383	887	2,844	2,013	1,646	1,565	7	2	2	1	3	10,612
Shortraker rockfish	268	0	0	94	174	69	17	295	191	48	446	282	1,884
Rougheye rockfish	1,789	203	231	19	29	5	4	389	128	26	299	501	3,623
Other rockfish[1]	67	14	12	1	0	0	17	12	32	27	60	318	560
Thornyheads	959	255	238	60	158	24	11	979	783	1,392	1,003	928	6,790
Giant grenadier	4,868	3,067	137	1,252	2,622	2,430	1,726	7,541	5,459	5,274	3,432	574	38,382
Skates	1,372	896	295	2,017	794	548	4,210	299	173	200	156	122	11,082
Other	2,011	790	1,874	2,171	624	1,440	5,299	933	276	894	587	389	17,288
All Species Combined	21,839	13,199	8,085	36,374	17,648	12,357	24,746	32,429	23,262	25,540	27,430	22,972	266,241
No. of sablefish tagged	16	228	60	22	5	2	1	542	536	716	953	941	4,022
No. of stations	10	17	5	14	9	6	9	10	7	10	11	9	117

For location of areas, see Figure 1.

[1]Includes all species of Sebastes rockfish except shortraker and rougheye rockfish; does not include thornyheads (Sebastolobus).

Table 3.--Catch rates and average weights of sablefish and Pacific cod a each station, Japan-U.S.cooperative longline survey in the Aleutian regic , eastern Bering Sea, and Gulf of Alaska, 1993. Dashes indicate no fish were caught.

Station no.	Sablefish No. caught/ 100 hooks	Sablefish average round weight (lb)	Pacific cod No. caught/ 100 hooks	Pacific cod average round weight (lb)
		Bering IV		
1	0.31	8.29	4.59	7.89
2	0.01	18.74	4.01	9.13
3	----	----	14.31	7.69
4	0.65	8.16	0.86	5.97
5	----	----	23.14	6.15
6	0.38	7.28	10.36	11.68
		Bering III		
7	----	----	28.83	7.63
8	0.15	7.58	4.94	6.35
9	----	----	15.29	7.94
10	0.40	9.88	2.25	8.44
11	0.18	4.52	13.68	6.68
12	0.15	11.46	3.40	6.86
13	0.63	7.50	4.13	7.28
14	----	----	9.26	5.42
15	0.41	10.49	6.51	12.92
		Bering II		
16	----	----	18.15	4.65
17	0.51	7.56	20.01	5.47
18	1.01	7.54	14.65	7.05
19	----	----	32.75	5.67
20	1.83	6.92	16.77	4.63
21	----	----	22.65	6.02
22	0.33	8.71	17.77	6.50
23	----	----	9.19	6.44
24	0.42	5.00	16.47	5.05
25	2.68	6.79	----	----
26	0.57	5.91	----	----
27	0.09	4.45	5.95	5.62
28	0.13	3.81	15.18	5.97
29	0.08	2.76	18.18	7.52
		Bering I		
30	0.32	4.70	6.60	6.86
31	0.46	4.48	10.58	4.83
32	0.83	11.46	8.00	5.89
33	3.33	9.19	6.01	8.25
34	4.35	6.26	0.36	7.21

Table 3.--(continued).

Station no.	Sablefish: No. caught/ 100 hooks	Sablefish: average round weight (lb)	Pacific cod: No. caught/ 100 hooks	Pacific cod: average round weight (lb)
		Bering V		
109	----	----	14.15	7.83
110	0.32	6.72	12.14	8.05
111	----	----	17.07	8.31
112	----	----	13.40	7.72
113	0.25	6.97	7.69	9.90
114	----	----	16.20	6.57
115	0.15	12.46	5.46	7.12
116	----	----	12.46	6.86
117	0.15	7.32	7.16	9.88
		Eastern Aleutians		
35	1.69	8.29	10.69	8.33
36	0.68	8.31	11.28	8.66
37	2.62	5.56	2.89	7.39
38	10.58	5.56	3.10	4.72
39	10.30	7.76	2.41	5.78
40	8.16	5.47	4.47	5.20
41	3.60	5.16	7.19	10.03
42	1.78	5.62	10.58	4.63
		Western Aleutians		
43	0.49	7.43	7.60	5.91
44	0.03	10.58	20.74	6.94
45	0.50	8.93	11.14	15.21
46	1.06	7.76	16.69	9.04
47	0.24	9.19	8.03	7.05
48	0.68	11.46	6.31	7.36
49	0.60	8.55	4.29	20.81
50	1.33	9.10	13.92	5.40
51	----	----	17.25	5.07
52	0.43	7.94	15.10	5.53
		Eastern Aleutians		
53	1.67	6.19	22.36	4.10
54	1.75	8.47	22.04	5.95
55	1.13	6.44	12.51	5.11
56	0.83	6.00	9.76	5.60
57	2.71	4.50	7.25	4.96
58	4.79	4.19	11.57	5.00
59	2.57	5.58	12.08	5.45
60	3.13	5.53	20.51	6.88
61	7.15	5.45	10.90	6.77

Table 3.--(continued).

Station no.	Sablefish: No. caught/ 100 hooks	Sablefish: average round weight (lb)	Pacific cod: No. caught/ 100 hooks	Pacific cod: average round weight (lb)
		Shumagin		
62	10.06	8.38	9.11	8.09
63	12.06	6.57	16.72	5.75
64	8.72	3.57	7.33	5.20
65	18.22	7.30	11.50	6.04
66	24.25	7.23	8.32	4.63
67	15.69	7.36	10.40	4.54
68	16.06	6.19	8.08	4.96
69	18.75	5.49	8.68	4.67
70	16.64	4.01	14.47	4.83
71	18.56	7.21	4.79	4.52
		Chirikof		
72	7.60	6.08	5.60	5.60
73	14.31	2.60	7.57	5.29
74	26.40	6.31	4.24	5.45
75	19.64	3.81	15.99	6.28
76	21.67	7.41	4.63	5.93
77	23.22	7.58	----	----
78	17.04	6.86	2.18	5.71
		Kodiak		
79	29.69	5.97	0.92	6.19
80	12.94	8.40	0.97	6.48
81	23.07	6.68	0.01	----
82	18.78	3.75	1.82	5.84
83	15.47	5.75	----	----
84	12.06	6.08	2.54	5.53
85	14.90	6.06	0.63	5.03
86	21.54	9.59	----	----
87	24.14	7.85	3.14	5.56
88	27.26	6.79	1.06	4.92
		Yakutat		
89	19.18	8.00	0.26	6.35
90	12.14	7.87	1.29	4.87
91	24.01	7.12	1.17	5.38
92	29.26	7.65	1.44	9.04
93	37.39	9.35	0.26	4.72
94	32.76	7.28	0.31	4.94
95	33.04	7.85	----	----
96	20.65	7.50	----	----
97	19.76	6.42	0.21	7.74
98	20.86	8.40	0.19	7.65
99	31.11	8.55	0.22	7.78

Table 3.--(continued).

Station no.	Sablefish No. caught/ 100 hooks	Sablefish average round weight (lb)	Pacific cod No. caught/ 100 hooks	Pacific cod average round weight (lb)
		Southeastern		
100	47.35	8.80	0.01	7.05
101	41.65	7.50	----	----
102	47.79	8.20	----	----
103	7.65	5.62	5.42	6.48
104	23.33	6.24	0.06	7.16
105	24.43	7.05	----	----
106	24.63	6.39	----	----
107	22.96	6.57	0.03	6.17
108	21.32	6.59	----	----

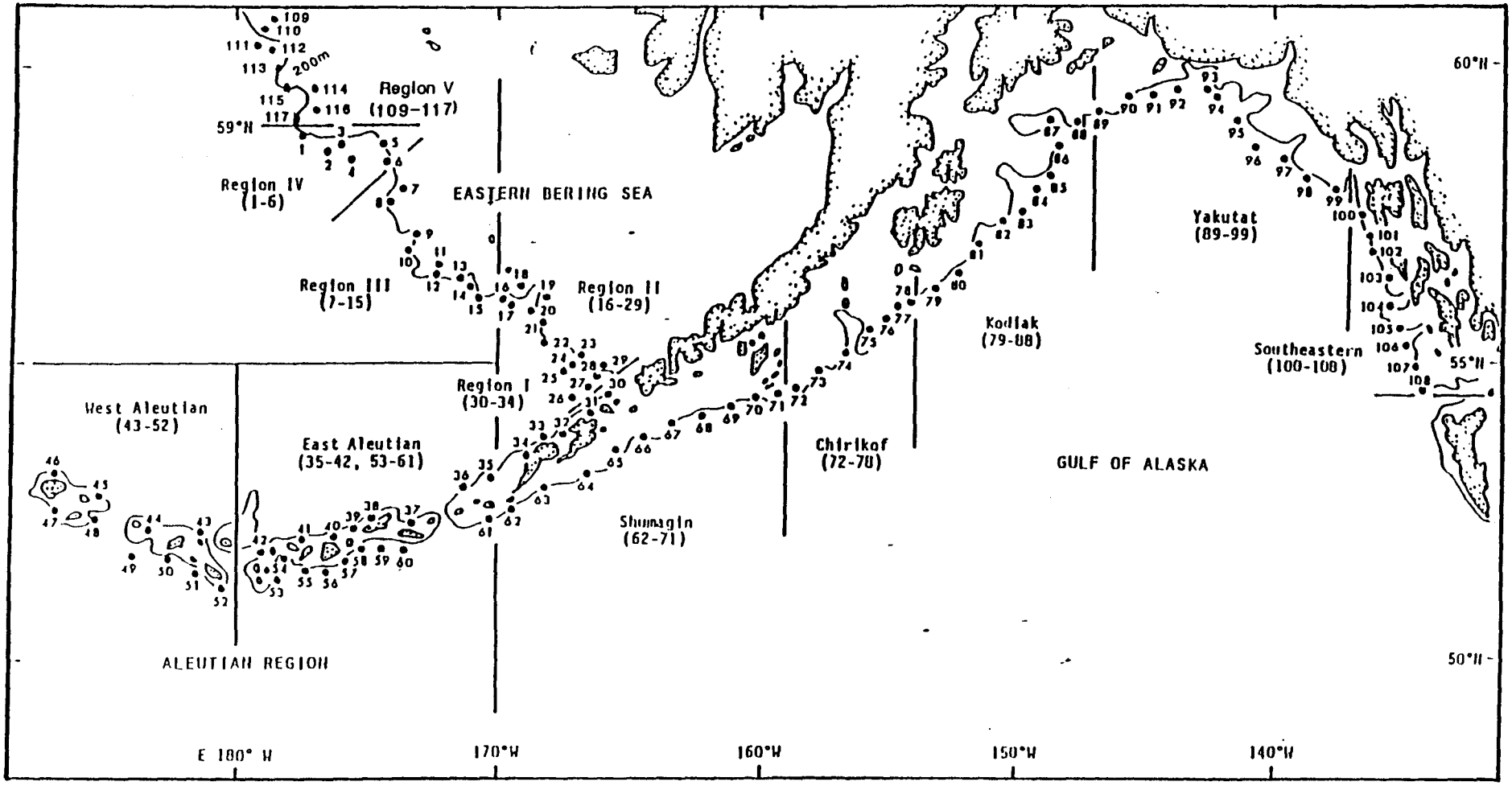

Figure 1.--Location of stations, Japan-U.S. cooperative longline survey in the Aleutian region, eastern Bering Sea, and Gulf of Alaska, 1993.